CruzPlot

An S-Plus Utility Mapping Program

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INTRODUCTION

CruzPlot is a utility program which creates coastline maps and plots data on the maps. The main feature of the software is the ability to create publication-quality map graphics quickly and easily with a user-friendly interface. CruzPlot does not replace specialized map-oriented analytical software such as ArcView or Surfer. CruzPlot is written in S-Plus 6.1 (Insightful Corporation) and runs under the Microsoft Windows XP operating system.

The program's features reflect its main use by the Protected Resources Division (PRD) of the Southwest Fisheries Science Center, NOAA Fisheries (SWFSC). In particular, it is oriented to the ocean and to data files in the format ("DAS") produced by WinCruz, the data-entry program used on cetacean line-transect surveys at the SWFSC. CruzPlot is specifically designed to plot marine mammal and turtle sightings directly from DAS files, but it can also plot data from other files that contain latitude and longitude values. CruzPlot can produce maps virtually anywhere in the world at any scale, but only coastlines are shown. If appropriate data are supplied, the program can plot additional features such as depth, elevation or political boundaries.

To get data for coastline positions, CruzPlot calls COAST32.exe, a Fortran program written by Paul Fiedler. As currently implemented at the SWFSC and described in Program Setup below, COAST32 runs on a server to which the user has access as a shared drive. For more information on COAST32, refer to the document Coast Instructions.pdf located on the server. The server has the CIA World Data Base II and DMA World Vector Shoreline datasets as binary files, which COAST32 uses to produce ASCII files of coastline points for a specified region. CruzPlot reads the ASCII coastline files and creates a map with visual details such as color fill, tick marks and labels controlled by the user. Once a file of coastline points has been extracted, it can be saved for later use, eliminating the call to COAST32.

After a map has been created, points, lines, text and graphics can be plotted on the map. Color, type and size of both points and lines are controlled by the user. For DAS files, survey effort can be shown, and data may be selected by date, Beaufort sea state and cruise number. For non-DAS files, latitude and longitude values to be plotted may be selected and/or grouped by values in another column.

PROGRAM SETUP

1. If you do not have S-Plus on your computer, ask ITS to add your name to the S-Plus users list at SWFSC. Then follow the step-by-step instructions provided on the ITS web page to install S-Plus 6.1 Professional Network Version: http://lajolla.noaa.gov/its/internal/technote/splus6install.htm The S-Plus network license at the SWFSC limits the number of concurrent users to three.

2. Map a network drive (e.g., letter "Z") to the server \\stenella\coast and make sure the drive will reconnect at startup. Go to My Computer | Tools | Map Network Drive, type "\\stenella\coast" for Folder and check box for Reconnect at Logon). You may have to contact ITS to get permission to write on this drive. You may rename the mapped drive to something more informative, such as "CruzPlot" or "Coastline map plotting."

3. From your mapped (shared) drive, open (double click) the S-Plus script file named Open CruzPlot.ssc. You may place Open CruzPlot.ssc as an icon on your desktop to launch CruzPlot directly. A dialog box will appear and prompt you with the question, "Open the S-Plus project in which folder?" Browse to select the drive letter you chose for \\stenella\coast. If you mapped to the letter Z, then your choice will look like "Z:". Do *not* check the box Always start in this project. If S-Plus opens without prompting you for a project folder, go to Options | General Settings | Startup | Prompt for Project Folder and check the box.

4. CruzPlot can be run on your computer rather than on the shared drive. The S-Plus script file CruzPlot.ssc contains all code needed. You will also need to copy to your computer COAST32.exe, the binary coastline data files, the files with "level" in the name, and the SpCodes.dat file. If you choose to run CruzPlot in this way, you should check the shared drive periodically to obtain the latest version of CruzPlot. If you run CruzPlot over the shared drive, you will automatically be using the most up-to-date version.

GENERAL NOTES ON RUNNING CRUZPLOT

The program is controlled through dialog windows available under CruzPlot on the main S-Plus menu bar. The first step is to create a map of the area of interest. After a map has been created, there are options for displaying data, text or graphical shapes such as arrows or rectangles on the map. Advanced users may use all features of S-Plus, either through the S-Plus Commands window or through the Graphical Users Interface. Settings and preferences in an S-Plus session on the shared drive should not be changed, however, because such changes will apply to all users.

Options for plotting are entered in boxes in dialog windows, either by typing or by selecting from drop-down lists. When a box allows multiple selections, use control+click or shift+click to make multiple selections from the drop-down list. Multiple selections may also be entered from the keyboard, separated by commas and no spaces. If the number of selections is less than required, the selections will be repeated as needed; if the number of selections is more than required, the selections will be used in order up to the number needed. Boxes for symbols, colors, line types and fonts have numerical codes and descriptive text in the boxes (*e.g.*, "1 Black"), but the program uses only the numerical code. If entering from the keyboard, therefore, it is only necessary to type numbers. For example, type "5,1" rather than "5 Diamond,1 Circle" to select diamonds and circles as two plotting symbols (although the latter will work also).

Plotting on the map occurs each time the OK or Apply button is clicked. Clicking the OK button closes the dialog window after plotting. Clicking the Apply button keeps the window open after plotting, and allows the dialog to be used again for additional plotting on the same map. Each time plotting occurs, the settings in the window are saved. Within one session, past settings can be retrieved in the current box at the bottom of the dialog window. This feature of the dialog windows is useful, for example, to recreate the same base map and try another combination of symbols and/or colors.

Plotting occurs in the most recent graphics window created. Maps are graphics windows, but the Preview selection and View Codes displays are also graphics windows, and if they have been created after the map, CruzPlot will attempt to plot on them instead of the map. Either close these windows before plotting on a map, or create a new map after opening these windows. Several maps may be created and open at the same time, but this practice may produce unpredictable results and is not recommended.

The map plot that CruzPlot produces is an S-Plus graphics object. Once created, the map, points, lines and text form a single non-editable object. However, legends may be editable, and text and graphic shapes added to the map with the Add Text to Map and Add Shapes to Map functions are editable. Editable means that the object can be moved and resized, text font and color can be changed, etc. The map with plotted data may be saved as an S-Plus graph (normally with extension *.sgr), exported in a variety of other file formats, or copied and pasted as an object into a document. When copying and pasting into a document, it is best to use the Paste Special function and paste the object as a Picture into the document. Pasting as an S-Plus object (the default) creates a much larger document file.

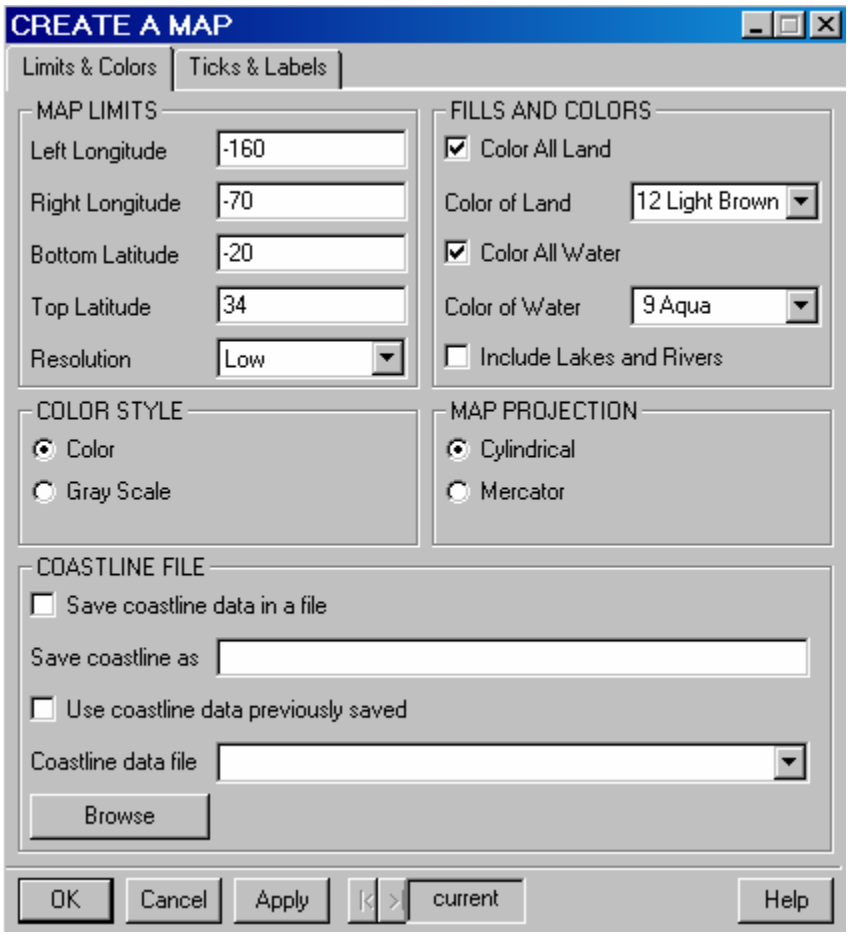
Data imported as S-Plus data frames on the \\stenella\coast drive are stored on the shared drive and are available to all users of CruzPlot. To access data in an S-Plus session, open the Object Explorer by clicking on its icon on the Standard toolbar (below main menu bar). Click on Data in the left pane and view all data objects in the right pane. To remove a data object from the session, select it and press Delete. If you do not want your data available to and possibly modified by other users, you can save your data in S-Plus data format (*.sdd) on your own computer. Open the data object from the Object Explorer (double click) and use File | Save As from the main menu.

Latitude and longitude data in CruzPlot are given as signed decimal numbers. South latitudes and west longitudes are negative; north latitudes and east longitudes are positive. Thus, 130° 30’W longitude is represented as -130.5.

This manual can be displayed with the Help button in dialog windows or by clicking on Open CruzPlot Manual from the CruzPlot menu. The Help menu in the main S-Plus menu bar gives access to S-Plus language help. Quick help tips appear when the cursor is placed over a particular item in a dialog window; the tips also display at the bottom of the screen. The current version of this manual is available as a pdf file on the shared drive as “CruzPlot manual” and is also available on the PRD software page at http://swfsc.nmfs.noaa.gov/PRD/softwares/software.html. The date of the most recent version is shown on the title page.

Create a Map

Limits & Colors

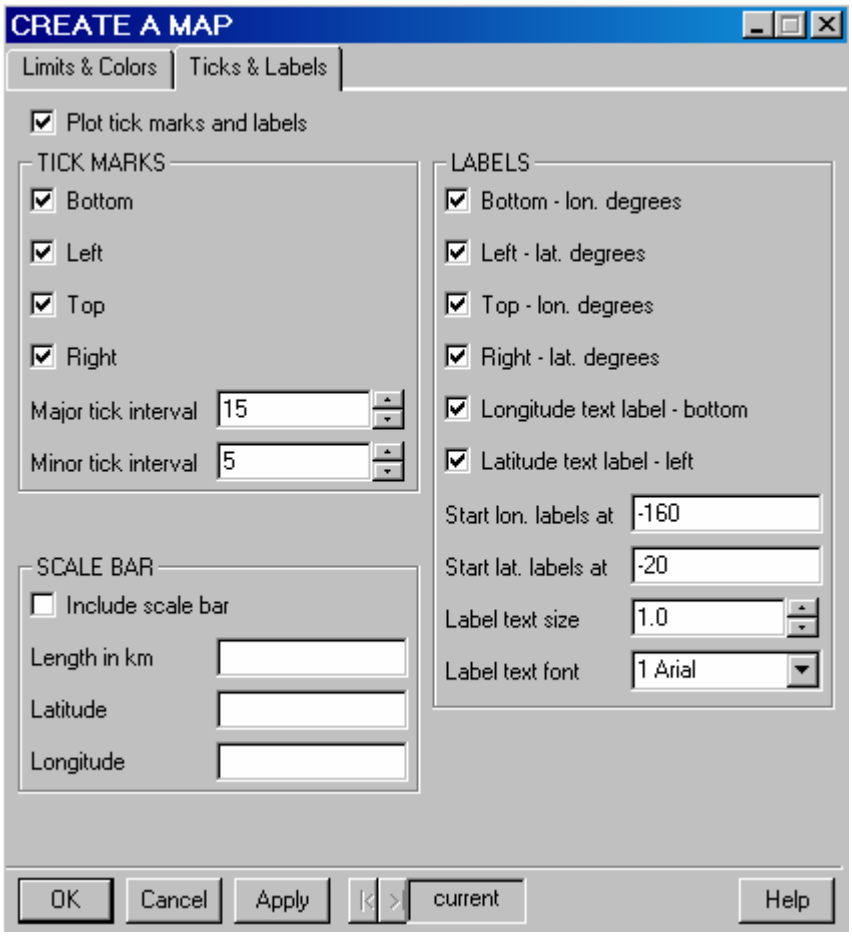


Note: default settings produce a color map of the eastern tropical Pacific.

- Left Longitude – left side of map in decimal degrees, using negative for west. Spanning the international dateline starting from either the eastern or western hemisphere is allowed.
- Right Longitude – right side of map in decimal degrees, using negative for west
- Bottom Latitude – bottom of map in decimal degrees, using negative for south
- Top Latitude – top of map in decimal degrees, using negative for south
- Resolution – choose the level of detail for your map depending on size of area. More detailed maps will produce larger files. Options are Crude (100km), Low (20km), Intermediate (5km), High (1.5km) or Full (0.2km).
- Color/Gray Scale – select a color style for the map and everything plotted on it.
- Color All Land – check this box to fill all land with color; uncheck it to draw only an outline
- Color of Land – select a number for the color of land
- Color All Water – check this box to color all water; uncheck it to leave water uncolored

- Color of Water – select a number for the color of water
- Include Lakes, Rivers – check this box to include lakes and rivers on the map
- Map Projection – choose Cylindrical (default) or Mercator. The cylindrical projection is centered on the middle of the latitude range (*i.e.*, x/y ratio of distances represented by 1º is cos((Bottom Latitude+Top Latitude)/2). For maps of small to moderate areas, there will be no difference between the projections. For maps with large latitude ranges, the Mercator projection will give less distortion at high latitudes. Distances between tick marks on the north-south (latitude) axis are equal in the cylindrical projection, unequal in the Mercator.
- Save coastline data in a file – check this box to save the file of coastline data points for later use. Give the file a name in the "Save coastline as" box.
- Use coastline data previously saved – check this box to retrieve a coastline file previously saved in the step above. The file either will be available as an S-Plus data frame from the drop-down menu in the "Coastline data file" box or can be imported using the Import/Browse button. Latitude and longitude limits will be reset to match the limits in the coastline file. You can make the map smaller (that is, use a subset of the saved coastline points), but not larger.

Ticks & Labels



- Plot tick marks and labels – uncheck to suppress all tick marks and labels on the map

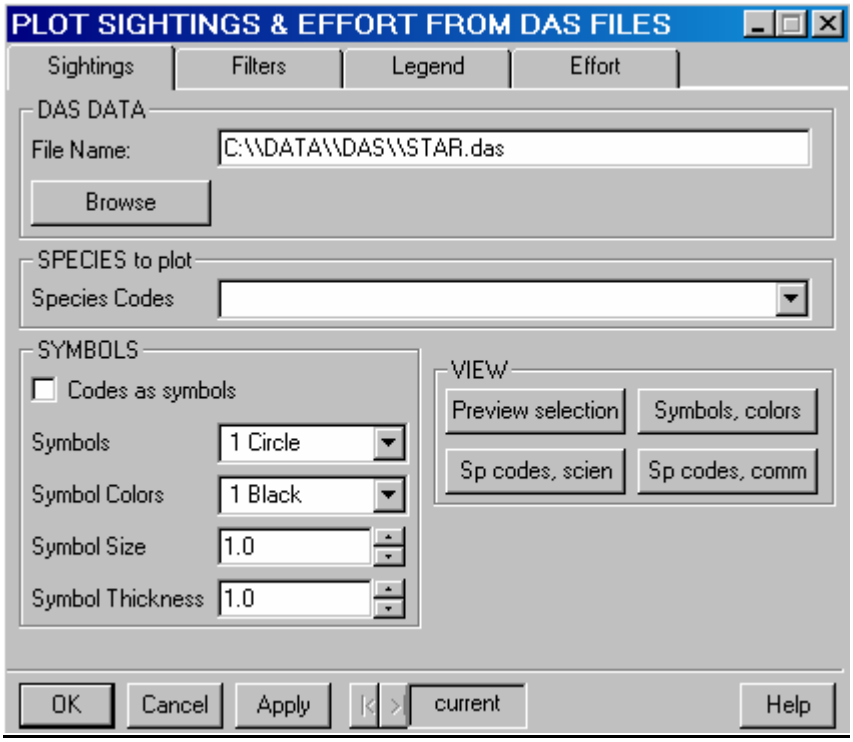
- Tick Marks, Bottom – check to show tick marks along bottom of map
- Tick Marks, Left – check to show tick marks on left side of map
- Tick Marks, Top – check to show tick marks along top of map
- Tick Marks, Right – check to show tick marks on right side of map
- Major tick interval – an integer number of degrees between major ticks (labeled ticks); default depends on map size
- Minor tick interval – an integer number of degrees between minor ticks (unlabeled ticks), starting with Left Longitude and Bottom Latitude; default depends on map size
- Include scale bar – check to show a simple scale bar on map. Caution: Because maps distort the curved surface of the earth, a scale bar cannot be accurate at all points on a map.
- Length in km – length of scale bar in kilometers; a label will be printed below the bar
- Latitude, Longitude – position of left end of scale bar, using negative for south and west
- Bottom - lon. degrees – check to show longitude degree labels along bottom of map
- Left - lat. degrees – check to show latitude degree labels on left side of map
- Top - lon. degrees – check to show longitude degree labels along top
- Right - lat. degrees – check to show latitude degree labels on right side
- Longitude text label – check to show "Longitude" label on bottom axis
- Latitude text label – check to show "Latitude" label on left axis
- Start lon. labels at – left-most longitude on the map at which to start labels on major tick marks, using negative for west. Default is Left Longitude.
- Start lat. labels at – bottom-most latitude on the map at which to start labels on major tick marks, using negative for south. Default is Bottom Latitude
- Label text size – text size for tick and axis labels, relative to 1.0. Tick labels are 60% the size of axis labels.
- Label text font – font for tick and axis labels. Use View Codes to display fonts.

The most efficient way to explore different map displays is to use the Apply button so that the CREATE A MAP dialog window remains open after the map has been created. Modify the settings with new map options that you prefer, delete the old map (to avoid having multiple maps open), and then click the Apply button again. Within an S-Plus session, all settings used to create maps are saved in the dialog window. Use the arrows next to the current box at the bottom of the dialog window to retrieve past settings.

After you have a map that you like, go to the CruzPlot menu at the top of the main S-Plus window and select what you want to do next (Plot From DAS File, Plot Non-DAS Data, Add Text to Map, etc). Dialog windows associated with these plotting functions are described below. DAS files are text files in a specific format produced by WinCruz, the data entry program used on line-transect cruises by the PRD. As you explore different options for plotting your data, the base map can be quickly recreated at any time. If the CREATE A MAP dialog window is open, click the Apply button to produce a map with the most recent settings. If the CREATE A MAP dialog window is not open, re-open it using the CruzPlot menu, retrieve the most recent settings by clicking on the left arrow near the current box at the bottom of the window, and then click the Apply button.

Plot From DAS file

Sightings

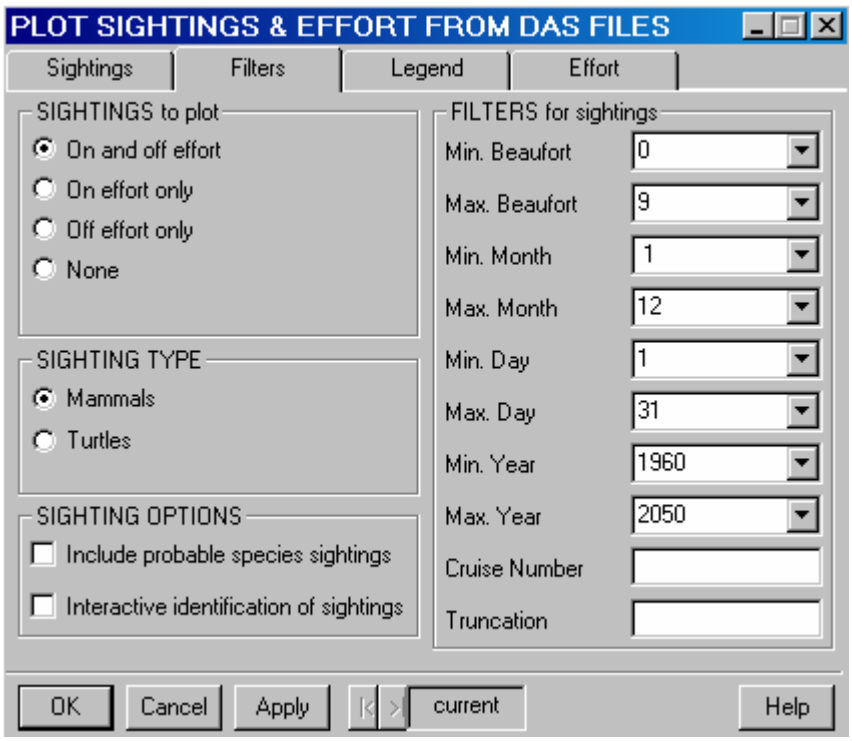


- File Name – either type in the file path to a DAS file on your computer or the shared drive (using double backslashes), or use the Browse button to locate the DAS file (this will automatically put the file path in the box). The default is simply an example.
- Species Codes – select species whose sightings are to be plotted. Each species (actually, a field-identifiable sighting category) is represented by a code. Cetaceans have number codes, while pinnipeds and turtles have letter codes. Click on either of the Sp codes buttons to display codes sorted by scientific or common name. For multiple selections from the drop-down list, use control+click or shift+click. Mammal and turtle sightings may not be plotted at the same time, but may be plotted sequentially on the same plot. Species codes are actually character strings, not numbers, so if entering species codes from the keyboard, use leading zeros – *e.g.*, eastern spinner dolphins are 010, not 10 – and multiple entries are separated by commas with no spaces.
- Codes as symbols – check to use the selected species codes as plotting characters instead of symbols – *e.g.*, if checked, the character string "013" (without quotation marks) would be plotted at the position of each striped dolphin sighting instead of a symbol.
- Symbols – select symbols to be plotted, one symbol for each species, or a single symbol for all species. Each symbol is represented by a number; click on the Symbols, colors button to display the symbols. Use control+click or shift+click for multiple selections. The order of the symbol codes corresponds to the order of the species codes.
- Symbol Colors – select a color for each symbol, or a single color for all symbols. Each color is represented by a number; click on the Symbols, colors button to display available

colors. Use control+click or shift+click for multiple selections. The order of the color codes corresponds to the order of the species codes.

- Symbol Size – size for all symbols relative to standard 1.0. To plot symbols of different sizes, plot again on the same map with a different size choice.
- Symbol Thickness – thickness for all symbols relative to standard 1.0. To plot symbols with different line thicknesses, plot again on the same map with a different thickness choice.
- Preview selection – displays your current selection of species codes, colors, symbols, symbol size and symbol thickness; close this window before plotting.
- Symbols, colors – displays codes for symbols, colors, line types and fonts (same as the View Codes display from the CruzPlot menu). Close this window before plotting.
- Sp codes, scien – opens a window displaying SWFSC species codes and scientific names sorted by scientific name
- Sp codes, comm – opens a window displaying SWFSC species codes and scientific names sorted by common name

Filters

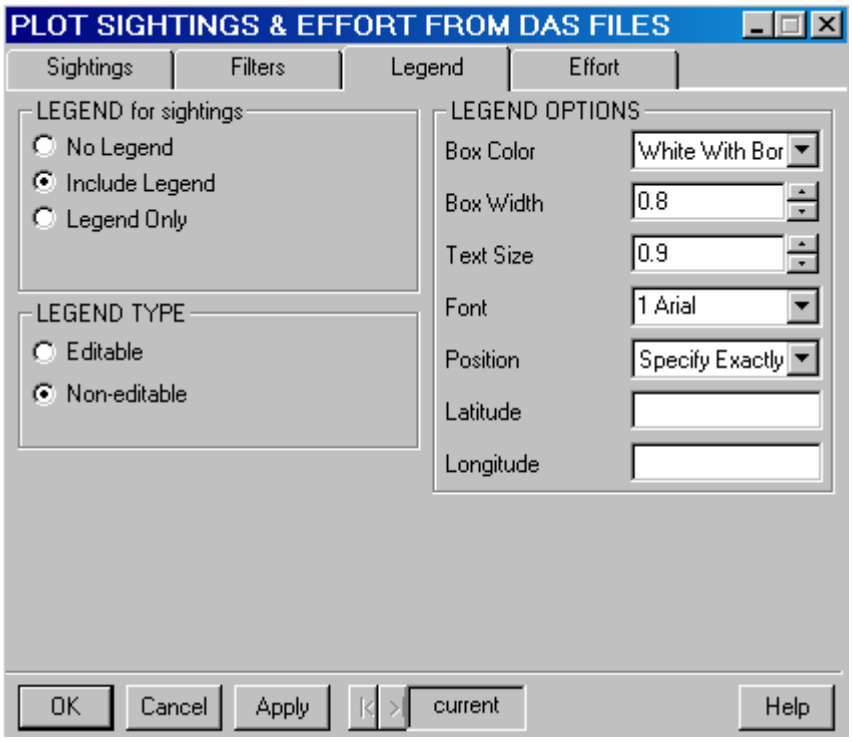


- Sightings to plot – choose one option: all on- and off-effort sightings, either on- or off-effort sightings separately, or no sightings (if plotting effort only).
- Sighting type – either Mammals or Turtles. Only one type may be plotted at a time. The correct type is set automatically when Species Codes are given on the Sightings page.
- Include probable sightings – for mammals, include sightings recorded as "probable" for the species code
- Interactive identification of sightings – if checked, allows interactive identification and labeling of sightings. After points have been plotted for each species code, the cursor will

change to a cross over the map. A left-click of the mouse near a point will identify the point by cruise number, sighting number and date; a right-click exits interactive mode. The position of the label can be controlled to some degree by clicking slightly to one side or the other of the point.

- Min, Max Beaufort - only sightings with associated Beaufort sea state values greater than or equal to minimum and less than or equal to maximum will be plotted
- Month, Day, Year – only sightings recorded on or between the specified dates will be plotted; the filter checks month, day, and year independently so that sightings must fit each criteria to be plotted; Example: to plot sightings made each December from 1986 to 2003 specify 1 & 31 for min. & max. day, 12 & 12 for min. & max. month, and 1986 & 2003 for min. & max. year. Effort filters (on Effort page) are updated to equal sightings filters when sightings filters are changed.
- Cruise Number – only sightings with this cruise number will be plotted. Only one cruise number at a time is allowed; leaving the box blank (default) includes all cruise numbers.
- Truncation – only sightings less than or equal to this perpendicular distance in nautical miles from the trackline will be plotted; leaving the box blank (default) plots sightings at all distances

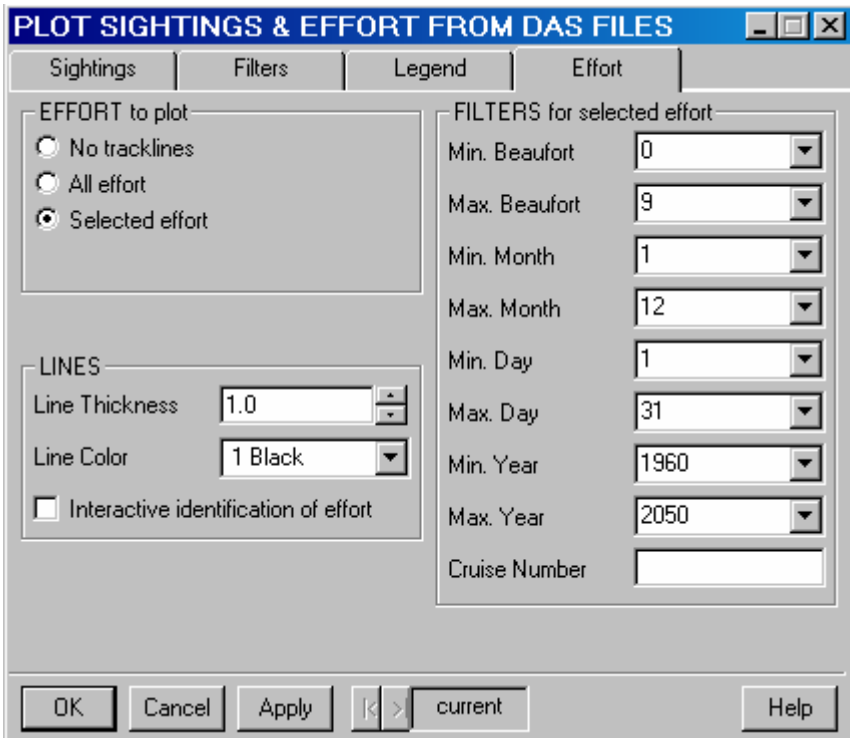
Legend



- Legend for sightings – select one option: “No Legend” (default) does not plot a legend on the map; “Include Legend” plots a legend with symbols and scientific names (corresponding to chosen species codes) after sightings are plotted; “Legend Only” plots a legend of the selected species but does not plot sightings. The latter option is useful for adding a legend after sightings have been plotted.

- Legend type – choose whether to make the legend editable or not. An editable legend has more options to control legend appearance, and scientific names will appear in italics. A left click on the legend box allows moving and resizing; a right click brings up a window with other legend properties. Individual legend items may also be edited. Display of symbols may be a little quirky on the screen, but should print properly. A non-editable legend may be preferred for a series of maps with a consistent legend format and position. If a non-editable legend is chosen, set legend options below.
- Box Color – choose among a transparent legend background (text is placed on top of map), a white background (text is placed on a white box with no border around it), or white background with a black border (the default).
- Box Width – the width of the legend box can be made longer or shorter.
- Text Size – the size of legend text can be increased or decreased.
- Font – font for text in the legend. Use View Codes to display fonts. Default is the font chosen for map labels.
- Position – specify where to place the legend on the map.
- Latitude, Longitude – position of the upper left corner of the legend when 'Specify Exactly' is selected for legend position, using negative for south and west. Decimals are OK.

Effort



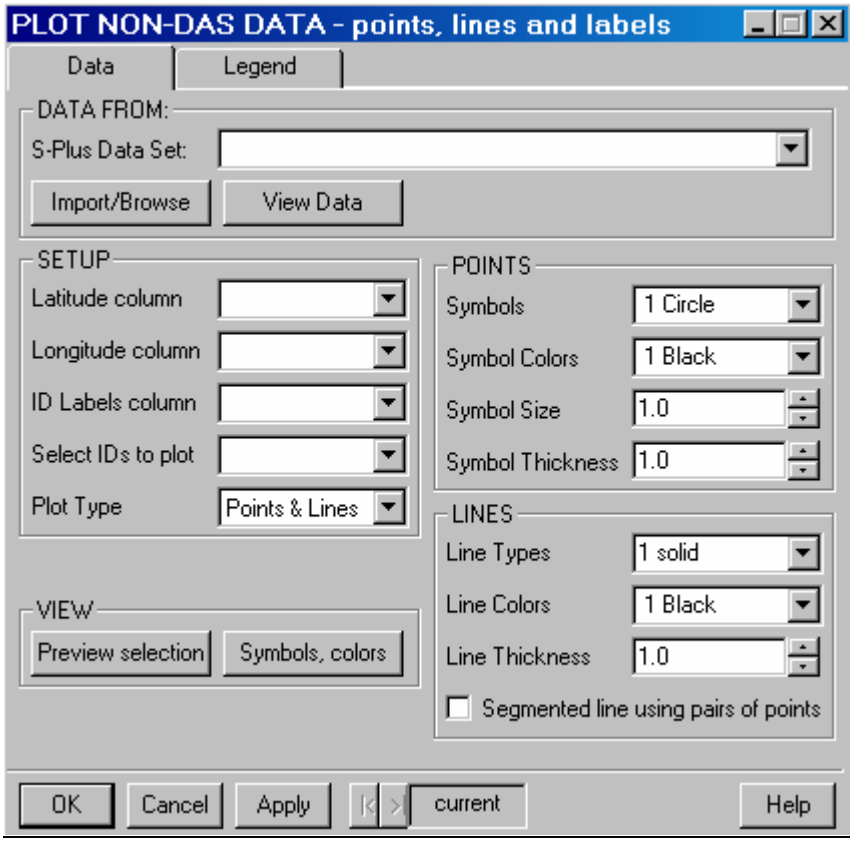
- Effort to plot – select one option: no tracklines (default), all tracklines on effort, or trackline effort selected by date, sea state or cruise number
- Line Thickness – thickness of effort lines relative to standard 1.0
- Line Color – color for tracklines. Use View Codes to display color choices.

- Interactive identification of effort – if checked, allows interactive identification and labeling. After tracklines have been plotted, the cursor will change to a cross over the map. A left-click of the mouse near a line will identify the transect by cruise number and date; a right-click exits interactive mode. The position of the label can be controlled to some degree by clicking slightly to one side or the other of the transect line.
- Min, Max Beaufort – only effort with associated Beaufort sea states greater than or equal to minimum and less than or equal to maximum will be plotted
- Month, Day, Year – only effort on or between the specified dates will be plotted; the filter checks month, day, and year independently so effort must fit each criteria to be plotted.
- Cruise Number – only effort on this cruise will be plotted. Only one cruise number at a time is allowed; leaving the box blank (default) includes all cruise numbers.

Note: When sightings filters (Beaufort, date and cruise number on Filters page) are changed, effort filters are updated automatically to match them, but not vice-versa. This allows selection of effort to be different from selection of sightings, if desired.

Plot Non-DAS Data

Data

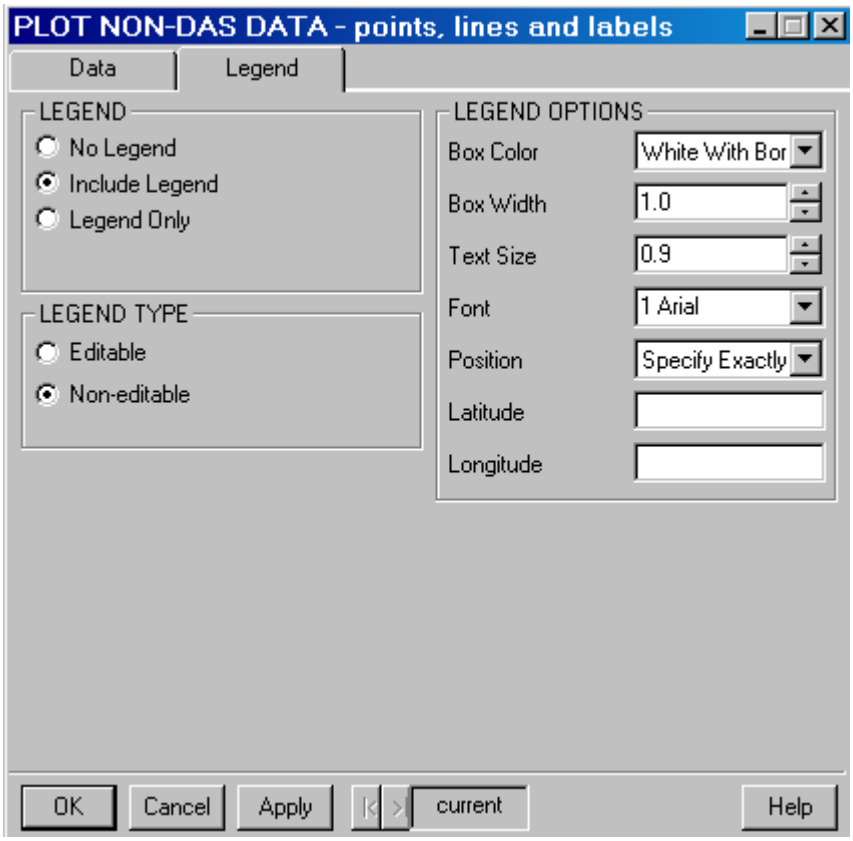


- S-Plus Data Set – select an S-Plus data frame from drop-down list of data sets in the session, or click on Import/Browse button to browse for data and create a new S-Plus data frame. The new data frame will appear after the import is completed and will be on the drop-down list. When importing a data file, it is useful to label the columns. For comma- or space-delimited text files, put the labels in the first row; S-Plus will recognize them as labels. Column labels may also be added or changed after import.
- View Data – displays the selected data frame; data can be edited from this window.
- Latitude column – select the column containing latitude values (as decimal degrees)
- Longitude column – select the column containing longitude values (as decimal degrees)
- ID Labels column – if you wish to plot a subset of the data, or to plot subsets in different ways (with different symbols, colors or line types, for example), specify the column which contains identifying labels or values for selection. Leave the box blank to plot all data.
- Select IDs to plot – if an ID Labels column has been specified, you may select a single or multiple labels (groups) to plot in any order by using control+click or shift+click; the default (no selection) is to plot all unique values. The order of the ID labels controls the plotting order; the same order applies to selections of symbols, colors and line types.
- Plot Type – choose to plot points, lines, both points and lines, or ID labels. Selecting ID labels means to plot the character string itself at the given position instead of a symbol – for

example, to plot the letter “A” at one set of positions, “B” at another, where the letters A and B are given in the ID Labels column of the data for each position.

- Preview selection – opens a window displaying your current selection of IDs, colors, symbols, lines, size and thickness; close this window before plotting.
- Symbols, colors – displays codes for symbols, colors, line types and fonts (same as the View Codes display from the CruzPlot menu). Close this window before plotting.
- Symbols – for points, select one or more symbols to be plotted; the order of the symbol codes corresponds to the order of the IDs.
- Symbol Colors – for points, select one or more color codes for the symbols; the order of the color codes corresponds to the order of the IDs and symbols.
- Symbol Size – for points, size for all symbols relative to standard 1.0
- Symbol Thickness – for points, thickness for all symbols relative to standard 1.0
- Line Types – for lines, select one or more line type codes (use View Codes to display line types); the order of the line type codes corresponds to the order given in Select IDs to plot.
- Line Colors – for lines, select one or more color codes for the lines; the order of the color codes corresponds to the order of the IDs.
- Line Thickness – for lines, thickness for all lines relative to standard 1.0
- Segmented line using pairs of points – check this box if data are listed in pairs (*e.g.*, begin effort, end effort); line segments will be drawn between sequential pairs of positions

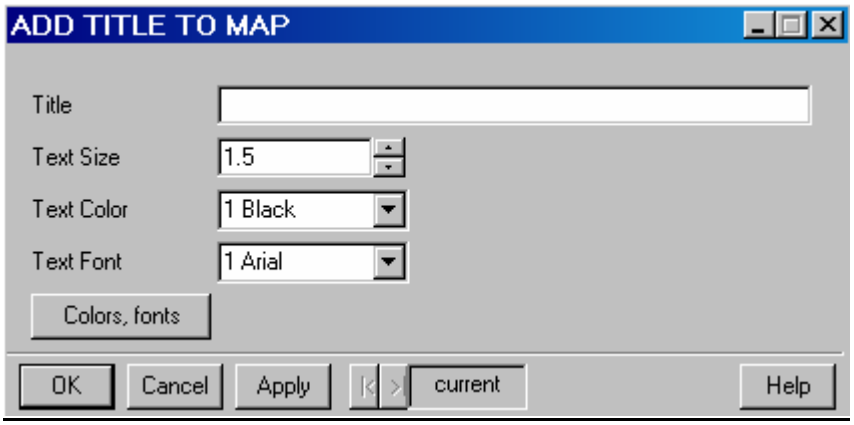
Legend



- Legend – select one option: “No Legend” (default) does not plot a legend on the map; “Include Legend” plots a legend of the specified ID labels when the points and/or lines are plotted; “Legend Only” plots a legend without plotting points and/or lines.
- Legend type – choose whether to make the legend editable or not. An editable legend has many options to control legend appearance. A left click on the legend box allows moving and resizing; a right click brings up a window with legend properties. Individual legend items may also be edited. A non-editable legend may be preferred for a series of maps with a consistent legend format and position. Set options below for a non-editable legend.
- Box Color – choose among a transparent legend background (text is placed on top of map), a white background (text is placed on a white box with no border around it), or white background with a black border (the default).
- Box Width – the width of the legend box can be made longer or shorter
- Text Size – the size of legend text can be increased or decreased
- Font – font for text in the legend. Use View Codes to display fonts. Default is the font chosen for map labels.
- Position – specifies where to place the legend on the map
- Latitude, Longitude – position of the upper left corner of the legend when ‘Specify Exactly’ is selected for legend Position, using negative for south and west. Decimals are OK.

** Troubleshooting notes**:** If data from an imported file do not plot on the map, check that (1) latitude and longitude are represented as signed decimal numbers, (2) latitude and longitude columns have been specified in the appropriate boxes, and (3) latitude and longitude columns have the correct data type of “double.” To check data type, open the data frame and select (highlight) the latitude and longitude columns. Right-click and choose Change Data Type to check the current data type and change it to double if necessary.

Add Title to Map



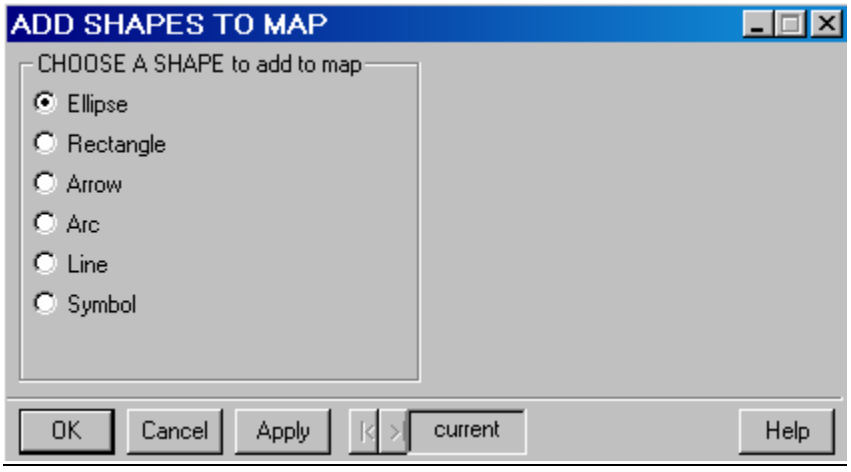
- Title – the title will appear on one line centered above the map
- Text Size – character size of text can be increased or decreased
- Text Color – color of text can be set with a color code
- Text Font – font of text in title. Default is the font chosen for map labels.
- Colors, fonts – displays codes for text color and font (same as View Codes)

Note: A title created with Add Title to Map cannot be edited. Use the Add Text to Map function to create a title with interactive control over position, size, color and font.

Add Text to Map

Clicking this menu item allows editable text to be placed on a map. No dialog window appears. Left-click allows moving and resizing of the text; right-click brings up a window with properties.

Add Shapes to Map



The shape you select will be placed more or less in the center of the map. Once on the map, the shape object can be edited to change its position and appearance. A left-click on the shape allows moving and resizing; a right-click brings up a window with properties of the shape object. The display of the shape objects may be a little quirky on the screen (may disappear partly or entirely depending on the size of the window), but they should print properly.

View Codes

Symbols, colors, line types and fonts are specified by numerical codes. A display of available symbols, colors, line types and fonts (Fig. 1) can be produced by clicking on the View Codes menu item, either color or gray scale, or by clicking on the Symbols, colors button in some dialog windows. Color code 0 plots the background color, which is normally white. Additional symbols may be created by overlaying the standard symbols, or by using different combinations of size and color. Default font assignments in CruzPlot are: 1=Arial, 2=Times New Roman, 3=Courier New, 4=Technical, 5=Euclid, 6=Arial Black, 7=Monotype Corsiva, and 8=Symbol. Advanced users can change any of the codes and utilize additional colors and fonts. However, unless changes to codes are explicitly changed back to the defaults, changes will remain in effect for other users of the shared drive, so this is not recommended. If necessary, run CruzPlot on your own computer and make customized changes locally.

The exact appearance of symbols, colors, line types and fonts will vary by monitor and printer. Print the View Codes page to see exactly how they will look for your hardware. A larger range of gray scales can be produced by creating a color map but printing it in black-and-white.

If the View Codes display has been produced *after* a map has been created, CruzPlot will attempt to plot points and lines on the View Codes page rather than on the map. Either close the View Codes page before plotting, or create the View Codes page before creating a map.

Open CruzPlot Manual

Clicking this menu item will open a window displaying this manual.

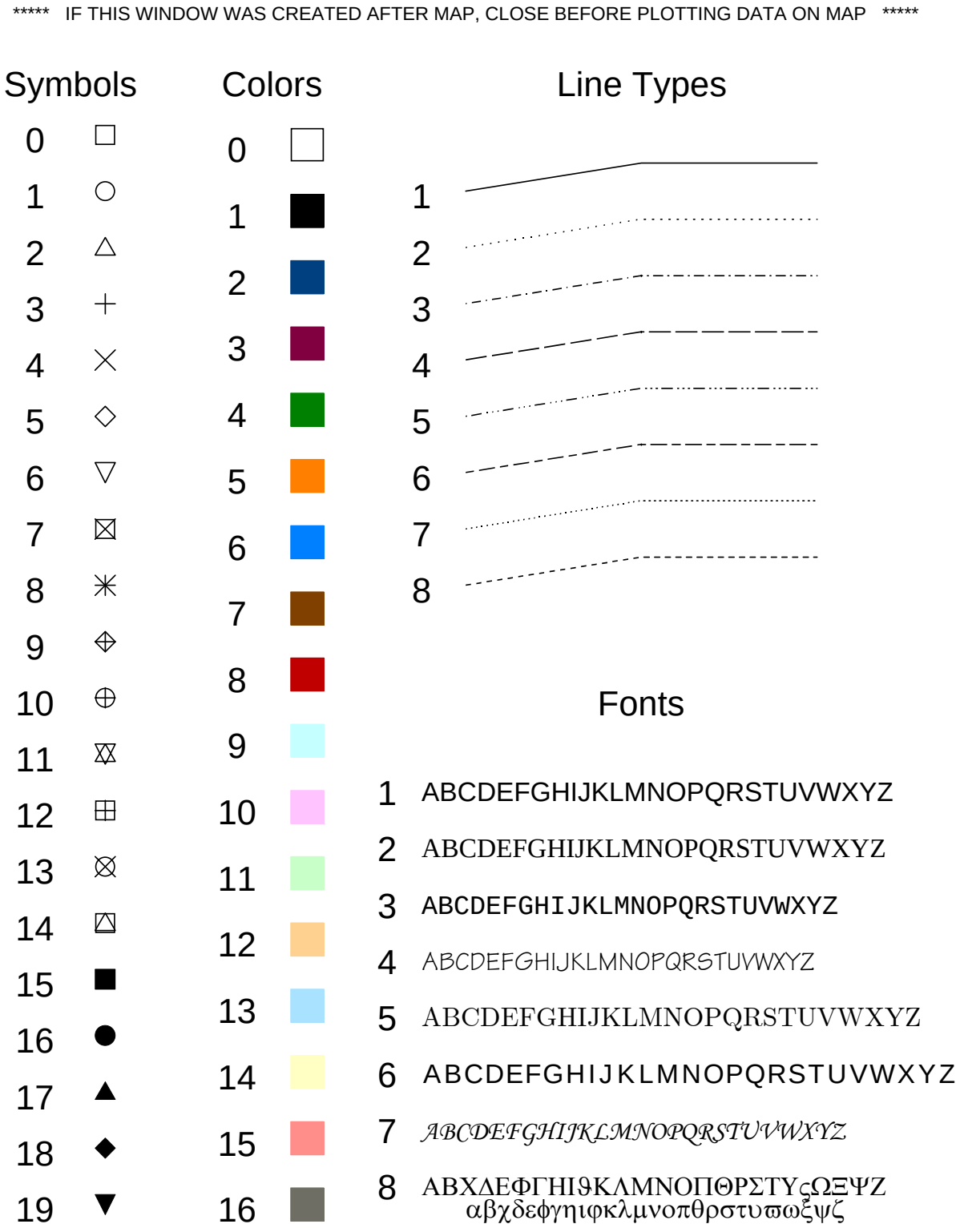


Fig. 1. Display of codes for symbols, colors, line types and fonts produced by View Codes.